

Effect of Photoperiod on the Development of *Pholcus crypticolens* BÖS. et STR. (Araneae:Pholcidae)

Kazuyoshi MIYASHITA¹⁾

宮下和喜¹⁾: ユウレイグモの発育に及ぼす光周期の影響

Abstract: Upon rearing under natural conditions and at 25°C with a long (LD-16:8) photoperiod, the nymphs of *Pholcus crypticolens* developed into adults in 45–85 days. Upon rearing at 25°C with a short (LD-10:14) photoperiod, however, they required 90–175 days for development. This remarkable developmental delay under a short photoperiod resulted from prolongation of the last instar.

Introduction

In previous papers, I have reported the effect of photoperiod on the development of several spider species (MIYASHITA, 1986, '87, '88, and '89). In the present experiment, I investigated the effect of photoperiod on the development of *Pholcus crypticolens* BÖS. et STR. for comparison with the results obtained in the previous experiments.

Materials and Methods

A female with an egg-sac was collected in the mulberry field of our school on 7 July, 1989. Nymphs emerged from the egg-sac on 12 July and molted on 16–17 July without feeding. These 2nd instar nymphs were kept individually in screw-topped glass vials, 4 cm in diameter and 7.5 cm in height, on 18 July, and the vials were placed upside down. Thereafter, the nymphs were provided prey at intervals of 3–4 days until they became adults. The prey was *Sinella cuspidatus* (Collembola) for 2nd instar, and *Drosophila melanogaster* (Drosophilidae) adults and leafhoppers (Deltocephalidae), mainly *Recilia oryzae*, for 3rd–5th instars. The number of prey provided each time was increased from 1–3 to 2–4 as development of the experimental animals proceeded.

Nymphs were divided into 3 groups for rearing under 3 different conditions, i.e., 1) under natural conditions, 2) at 25°C with a long (LD-16:8) photoperiod in an incubator, 3) at 25°C with a short (LD-10:14) photoperiod in an incubator. Natural conditions were those at a semi-

1) Department of Biology, Faculty of Science, Tokyo Metropolitan University, 2-1-1 Fukazawa, Setagaya-ku, Tokyo, 158 Japan

東京都立大学理学部生物学科 〒158 東京都世田谷区深沢 2-1-1

outdoor situation protected from direct sunshine, rain and wind. Day length at the start of the experiment (18 July), after one month (19 August), at the winter solstice (22 December), and at the end of the experiment (12 April of the following year) was 15 h 50 min, 14 h 31 min, 10 h 57 min, and 14 h 10 min, respectively. Long and short photoperiods were prepared by switching on and off two 18-W fluorescent tubes in an incubator, the tubes providing 1200–2000 lux. Humidity was provided by placing a piece of wet filter paper, 2 cm × 2 cm, on the inner side of each vial at the time of each feeding.

Seven experimental animals were used in each rearing. Unfortunately, one individual reared under natural conditions escaped during the course of the experiment, and was therefore omitted from Fig. 1.

Results and Discussions

The results obtained are summarized in Fig. 1.

Upon rearing under natural conditions, all nymphs required 45–80 days for development to adulthood, except for one male (indicated by * in the graph) which overwintered and developed into an adult on 12 April of the following year, 274 days after emergence. The mean develop-

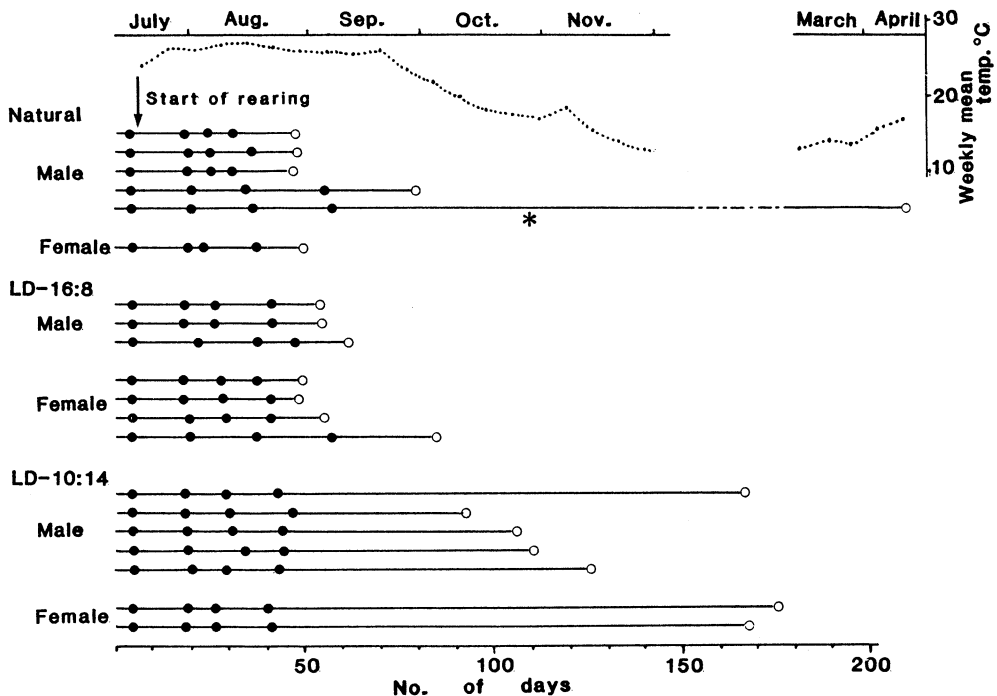


Fig. 1 Developmental process of *Pholcus crypticolen* nymphs reared under natural conditions, at 25°C with LD-16:8, and at 25°C with LD-10:14. Solid circles indicate moltings and clear ones final molting. Dotted line shows mean weekly temperature at a semi-outdoor situation.

mental period was calculated to be 53.0 ± 13.5 days, omitting the above mentioned male. Upon rearing at 25°C with a long photoperiod, all nymphs developed into adults in 45–85 days with a mean of 56.3 ± 12.7 days, and thus there was no significant difference between these means ($P > 0.1$ by *t* test).

Upon rearing at 25°C with a short photoperiod, however, the nymphs developed in 90–175 days with a mean of 134.3 ± 31.7 days. In other words, there was a remarkable developmental delay. As shown in Fig. 1, it is clear that this delay was due to prolongation of the last instar. A similar developmental delay under a short photoperiod has already been reported in *Dolomedes sulfureus* L. KOCH and *Xysticus croceus* FOX by MIYASHITA (1986 and '89). In *X. croceus*, such prolongation under a short photoperiod occurred in either the last instar or the last and penultimate instars, coupled with an additional molt(s) at times.

On the other hand, some species are insensitive to photoperiod. For example, *Pholcus phalangioides* (FUESSLIN) was reported to develop normally irrespective of photoperiod (MIYASHITA, 1988). *Achaearanea tepidariorum* (C.L. KOCH) also showed insignificant difference in development under long and short photoperiods, although either the last instar or the last and penultimate instars were somewhat prolonged in females reared under a short photoperiod (MIYASHITA, 1987).

According to SCHEAFER (1977), who pointed out the existence of 2 spider groups sensitive and insensitive to photoperiod, it can be said that *P. crypticolens*, *D. sulfureus* and *X. croceus* belong to the sensitive group, whereas *P. phalangioides* and *A. tepidariorum* are insensitive. It is of interest that, although species insensitive to photoperiod have a tendency to inhabit buildings in spite of the strong influence of artificial lighting, sensitive species never do so and live only in the field.

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摘 要

ユウレイグモの幼生を自然、 25°C 長日、 25°C 短日の3条件下で飼育したところ、自然および 25°C 長日条件下では45～85日で成体になったが、 25°C 短日条件下では90～175日もかかって成体になった。この発育の遅れは、最終齢期の延長によるものであった。

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